

DELAWARE MATERIAL SPECIFICATION

SLIDE GATES MS 223

1. SCOPE

This specification covers the quality of metal slide gates for water control.

2. CLASS AND TYPE OF GATE

The class of gate will be expressed as a numerical symbol composed of the seating head and unseating head. The two numbers will be separated by a hyphen with the seating head listed first. For this purpose, the heads shall be expressed in terms of feet of water.

Gates shall be of the specified types as defined below:

Light Duty:

Type MLS-1 gates shall be cast iron with cast iron seat facings.

Type MLS-2 gates shall be fabricated metal gates.

Moderate Duty:

Type MMS-1 gates shall be cast iron with bronze seat facings, cast iron or galvanized structural steel guides, and galvanized steel, bronze, or stainless steel fasteners.

Type MMS-2 gates shall be cast iron with bronze seat facings, cast iron or stainless steel guides, and bronze or stainless steel fasteners. Guides and fasteners shall be stainless steel, when specified.

Heavy Duty:

Type MHS-1 gates shall have gray cast iron slides, frames, guides and yokes and shall be fitted with: (1) bronze seat facings, bronze wedges and wedge blocks or wedge seat facings, and bronze stem blocks or thrust nuts, (2) bronze or stainless steel fasteners, and (3) cold rolled steel stems, except that stems shall be stainless steel where so specified.

Type MHS-2 gates shall have gray cast iron slides, frame, guides, and yokes and shall be fitted with: (1) Stainless steel seat facings, wedges, wedge seat facings, stems and fasteners, and (2) austenitic cast iron stem blocks or thrust nuts.

Type MHS-3 gates shall have austenitic gray cast iron slides, frames, guides, and yokes and shall be fitted with: (1) nickel-copper alloy seat facings, wedges, wedge seat facings, stems and fasteners, and (2) austenitic cast iron stem blocks or thrust nuts.

3. QUALITY OF MATERIALS

Materials for slide gates and appurtenances shall conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements.

<u>Material</u>	<u>ASTM Specification</u>
Cast iron and Gray cast iron	A 48, Class 30, or A 126, Class B
Austenitic cast iron	A 436
Structural steel shapes, plates, and bars	A 36
Cold rolled steel	A 108
Carbon steel bars	A 108 or A 575
Stainless steel	A 167, A 276, or A 582 Type 302, 303, 304, or 304L
Castings, nickel and nickel alloy	A 494
Carbon steel sheets and strips	A 569
Zinc-coated carbon steel sheets	A 653 or A 924
Bronze bar, rods, shapes	B 21 or B 98
Naval bronze	B 21
Phosphor bronze	B 103 or B 139
Manganese bronze	B 138 or B 584
Silicon bronze	B 98 or B 584
Cast bronze	B 584
Nickel-copper alloy plate, sheet, strip	B 127
Nickel-copper alloy rod or bar	B 164
Rubber for gaskets and seals	D 2000
Galvanizing (zinc coating) shall conform to the requirements of Material Specification 582.	

4. FABRICATED METAL GATES (Light Duty Gates)

Fabricated metal gates shall be built to withstand the seating head expressed by the gate class designation. Unless otherwise specified, the gates shall be galvanized steel with flat-back frames.

5. CAST IRON GATES (Light Duty Gates)

The frame shall be cast iron of the specified type. The front face shall be machined to receive the gate guides.

The gate slide shall be cast iron and shall be fabricated to withstand the seating and unseating heads expressed by the gate class designation as defined in Section 2 of this specification.

Grooves shall be cast on the vertical sides of the slide to match the guide angles.

The gates guides shall be galvanized structural steel and shall be fabricated to withstand the total thrust of the gate slide due to water pressure and wedge action under maximum operating conditions.

Wedges and wedge seats shall have smooth bearing surfaces. Wedges may be cast as integral parts of the slide. Removable wedges and wedge seats shall be fastened to the slide, frame or guides by means of suitable studs, screws, or bolts and shall be firmly locked in place after final adjustment. Each interacting set of wedge and wedge seat shall be adjustable as needed to insure accurate and effective contact. Adjusting bolts or screws shall be bronze or galvanized steel.

Seat facings shall be machined to a smooth finish to insure proper watertight contact.

6. FRAME OR SEAT (Moderate and Heavy Duty Gates)

The frame shall be cast iron and of the specified type. The front face shall be machined to receive the gates guides and the rear face shall be machined as required to match the specified attaching means. For heavy duty gates, a dovetailed groove shall be machined on the perimeter of the front face to receive the seat facing.

7. GATE SLIDE (Moderate and Heavy Duty Gates)

The gate slide shall be cast iron, rectangular in shape and shall have horizontal and vertical stiffening ribs of sufficient section to withstand the seating and unseating heads expressed by the gate class designation as defined in Section 2 of this specification. For heavy duty gates, a dovetailed groove shall be machined on the perimeter of the slide face to receive the seat facing.

Tongues shall be machined on the vertical sides of the slide along its entire height to match the guide grooves and angles with a maximum clearance of 1/16 inch for gates smaller than 54 inches by 54 inches, and 1/8 inch for larger gates.

A nut pocket with reinforcing ribs shall be integrally cast on the vertical centerline and above the horizontal centerline of the slide. The pocket shall be of a shape adequate to receive a flat-backed thrust nut or stem block and shall be built to withstand the opening and closing thrust of the stem.

8. GATE GUIDES (Moderate and Heavy Duty Gates)

The gate guides shall be built to withstand the total thrust of the gate slide due to water pressure and wedge action. The gate guides shall be cast iron for heavy duty gates.

Grooves shall be machine-in cast iron guides to receive the tongue on the gate slide throughout the entire length of the guide.

The guides shall be of adequate length to retain a minimum of one-half the height of the gate slide when the gate is fully opened.

9. WEDGES AND WEDGE SEATS (Moderate and Heavy Duty Gates)

Pads for supporting wedges, wedge seats (or blocks) and wedge loops (or stirrups) shall be cast as integral parts of the gate frame, slide, or guides and shall be accurately machined to receive those parts.

Wedges and wedge seats shall have smooth bearing surfaces for moderate duty gates and shall have machine finish bearing surfaces for heavy duty gates. Removable wedges may be cast as integral part of the slide for moderate duty gates. Wedges shall be fastened to the gate slide, frame or guides by means of suitable studs, screws, or bolts and shall be firmly locked in place after final adjustment. Each interacting set of wedge and wedge seat shall be adjustable as needed to insure accurate and effective contact.

10. SEAT FACING

Moderate Duty Gates Seat facings shall be machined to a smooth finish to insure proper watertight contact. Bronze facings shall be securely attached by welding or by other approved methods.

Heavy Duty Gates Seat facings shall be pressed or impacted into the machined dove tailed grooves on the gate slide and frame and machined to a smooth finish to insure proper watertight contact.

11. YOKE

When a self-contained gate is specified, the yoke shall be of such design as to withstand the loads resulting from normal operation of the gate. For moderate and heavy duty gates, cast iron yokes shall be provided with machined pads for connecting to the ends of gates guides and to receive the stem thrust cap or handwheel lift.

12. FLUSH BOTTOM SEAL (Heavy Duty Gate)

When a flush bottom sealing gates is specified, a solid, square-corner type rubber seal shall be provided at the bottom of the gate opening. It shall be securely attached either to the bottom of the slide or to the frame. Metal surfaces bearing on the rubber seal shall be smooth and rounded as necessary to prevent cutting of the seal during gate operation.

13. GATE STEM AND LIFT (OR HOIST)

The gate stem and lift/hoist shall be of the specified type, size and capacity and, if hand operated, shall be capable of moving the gate slide under normal conditions, following unseating from the wedging device, with a pull on the handwheel or crank of not more than 25 pounds with the specified seating and/or unseating head of water against the gate.

Unless otherwise specified, the stem shall be carbon steel and shall be furnished in sections as necessary to permit reasonable ease in installation. Couplings shall be bolted, pinned, or keyed to the stem. The stem shall be furnished with rolled or machine-cut 29° Acme threads of sufficient length to completely open the gate. The threads shall be smooth and of uniform lead and cross-section, such that the nut can travel the full length without binding or excessive friction. For moderate and heavy duty gates, the stem shall be threaded for connection to the stem block or thrust nut on the gate slide.

The lift shall be compatible with the type of stem furnished. Unless otherwise specified, the lift nut shall be cast bronze for light and moderate duty gates and cast manganese bronze for heavy duty gates and shall be fitted with ball or roller thrust bearings designed to withstand the normal thrust developed during opening and closing of the gate at the maximum operating heads. All gears, sprockets and pinions shall be machine-cut, with ratios and strength adequate to withstand expected operating loads. Sufficient grease fittings shall be provided to allow lubrication of all moving parts. An arrow and the word "open" shall be cast on the rim of the handwheel or on the lift housing to indicate the direction of gate opening. Unless otherwise specified, the lift for the non-rising-stem gate shall be provided with an indicator capable of showing both when the gate is fully open and when it is fully closed for the moderate and heavy duty gates.

Provisions shall be made to prevent stem rotation within the stem block or thrust nut or at the connection the gate slide.

Stop collars shall be provided to prevent over-travel in opening and closing the gate.

14. STEM GUIDES

Unless otherwise specified, stem guides shall be cast iron for light duty gates and cast iron with bronze bushed collars for moderate and heavy duty gates, and be fully adjustable in two directions.

15. WALL THIMBLE (Moderate and Heavy Duty Gates)

When a wall thimble is specified, it shall be of the same cast iron used in the gate frame and of the section, type, and depth specified. The front flange shall be machined to match the gate frame and drilled and tapped to accurately receive the gate attachment studs.

Gaskets or mastic to be installed between the thimble and the gate frame shall conform to the recommendations of the gate manufacturer and shall be furnished with the thimble.

16. FASTENERS

Unless otherwise specified, all anchor bolts and other fasteners shall be galvanized steel or bronze for light duty gates; galvanized steel or stainless steel or bronze for moderate duty gates; and, of the quality and size as recommended by the gate manufacturer for heavy duty gates. All anchor bolts, assembly bolts, screws, nuts, and other fasteners shall be of ample section to withstand the forces created by operation of the gate while subjected to the specified seating and unseating heads. Anchor bolts shall be furnished with two (2) nuts to facilitate installation.

17. INSTALLATION INSTRUCTIONS

Prior to installation, the Contractor shall provide to the Engineer the manufacturer's complete installation data, instructions for adjustments and drawings or templates showing the location of all anchor bolts for each gate.

18. PAINTING

When specified, gates and accessories shall be painted by the designated paint system.

19. CERTIFICATION

The supporting data submitted to the Engineer shall include the name of the manufacturer, the manufacturer's model number (for standard catalogue items) or the seating and unseating heads for which the gate is designed together with such drawings and specifications as may be necessary to show that the gate conforms to the requirements of this specification.